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Engineering Solutions on In-Monolith Optics Update on Neutronics Calculations

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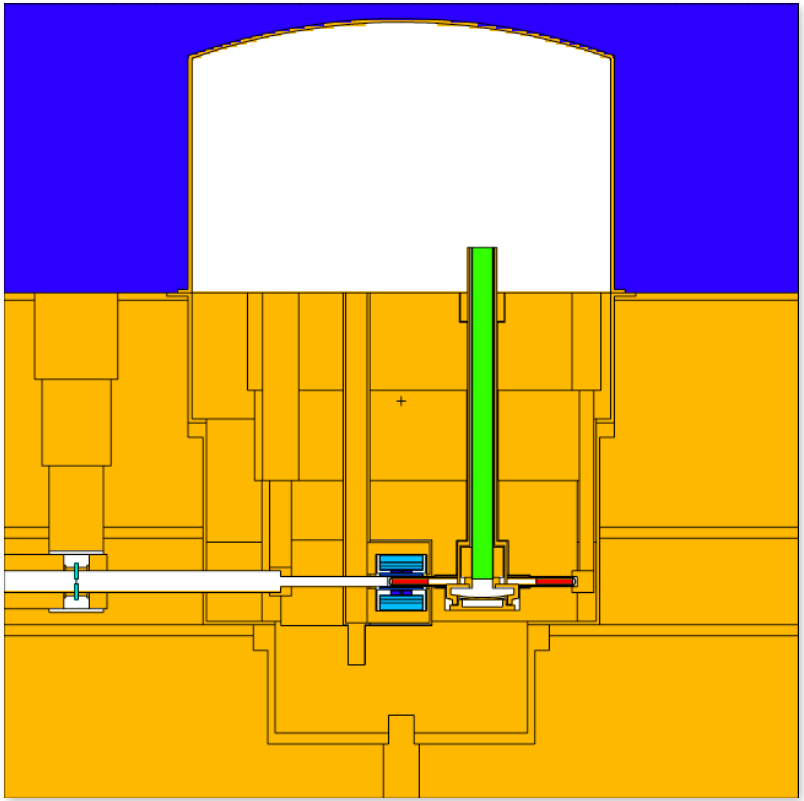
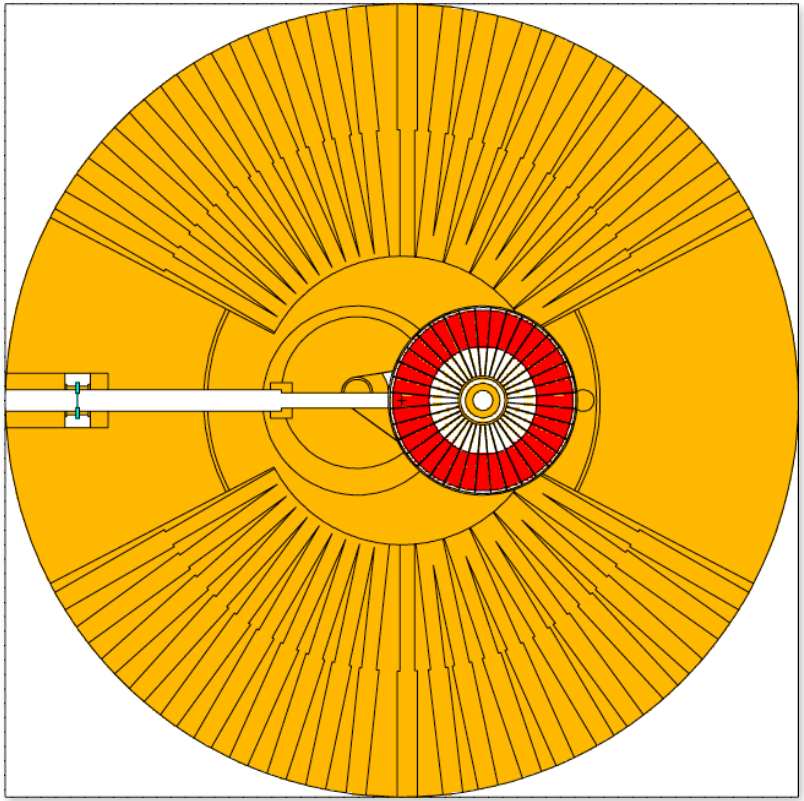
TARGET STATION MONOLITH

MCNP/PHITS neutronic master model V2.004





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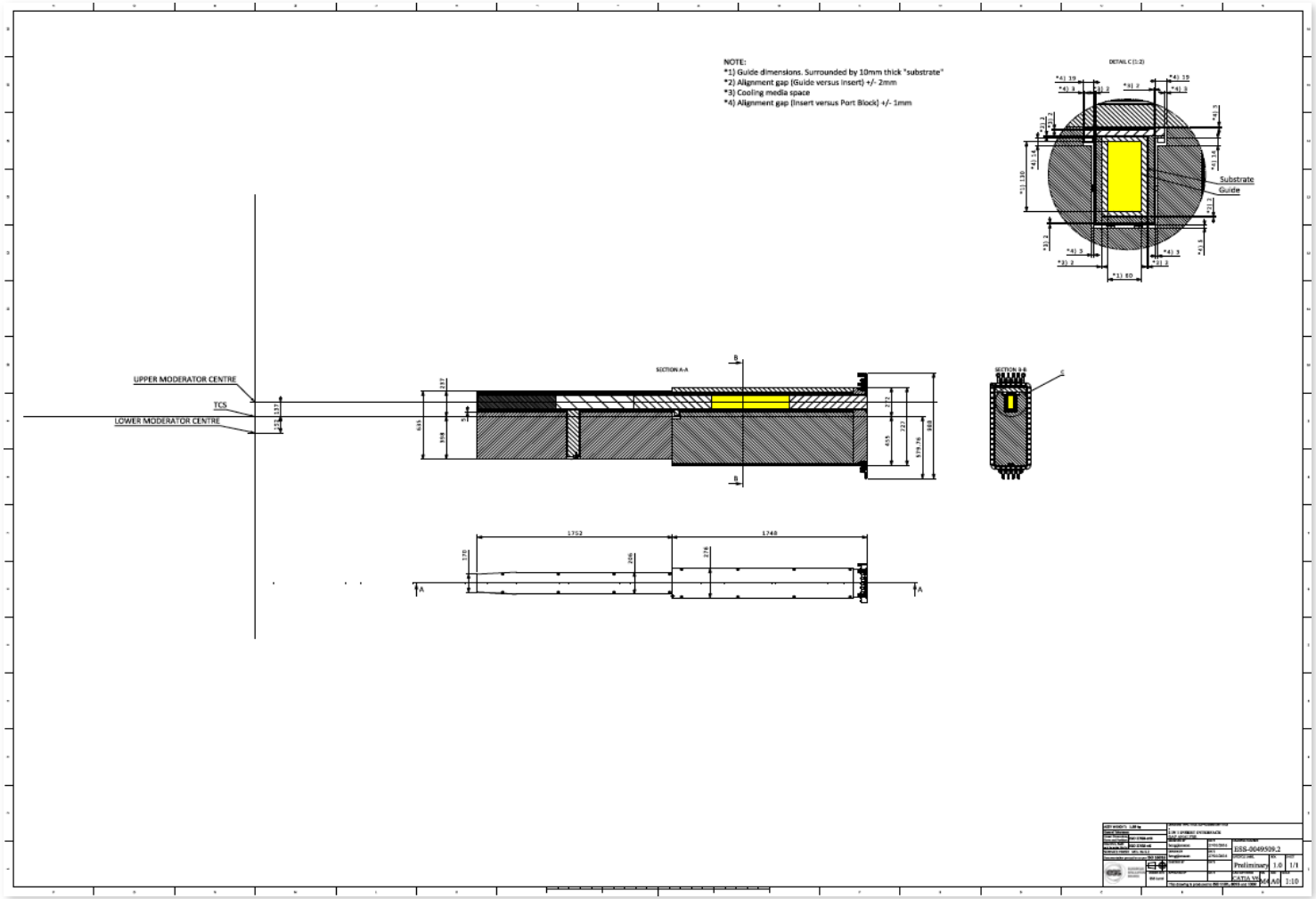
Neutron Guide Insert

Ref.: Bengt Jönsson



Neutron Guide Insert

Ref.: Damian Martin Rodriguez

Guide substrate
(materials: Steel, Al, Cu)

Shielding + Cooling + Alignment
(material: Steel)

Monolith insert
(materials: Steel)

- The guide part has to be consider symmetric, i. e., the beam section is 6 x 6 cm^2 without substrate.
- The gaps in the shielding + cooling + alignment part have to be minimized as much as budget and requirements on alignment and temperature stability allows.
  - Requirement in alignment: ±50 microns between guide pieces
  - Temperature stability: enough to fulfill requirement with alignment

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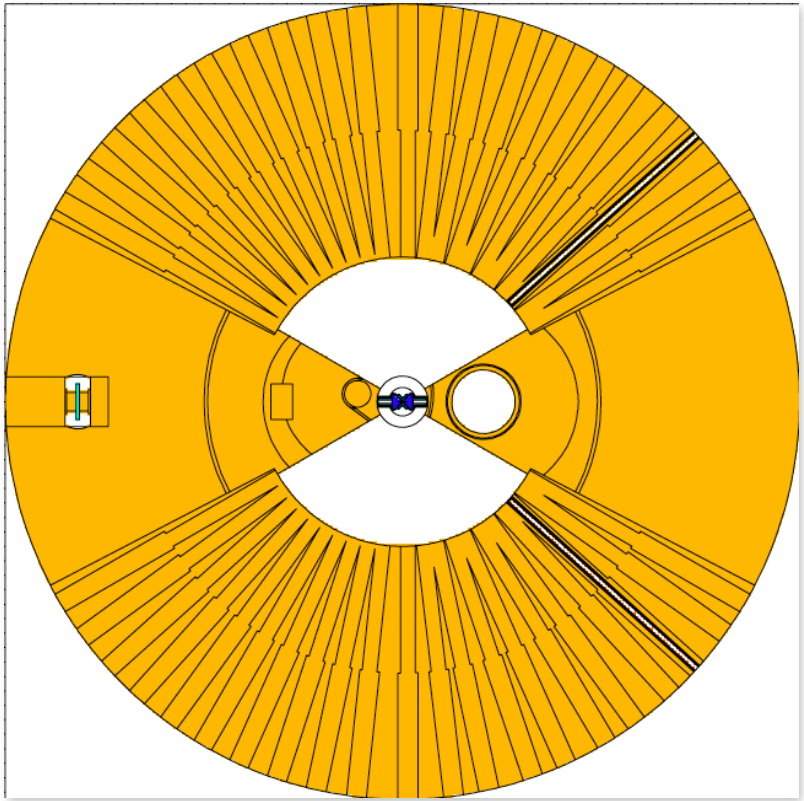
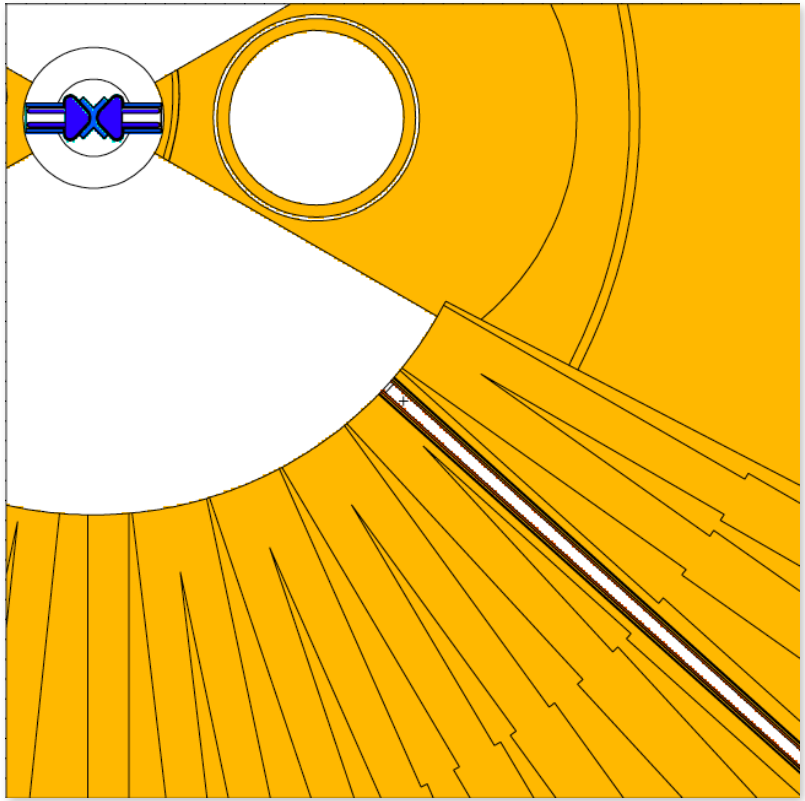
Neutron Guide Insert

The inserts are in South-03L and West-03L viewports





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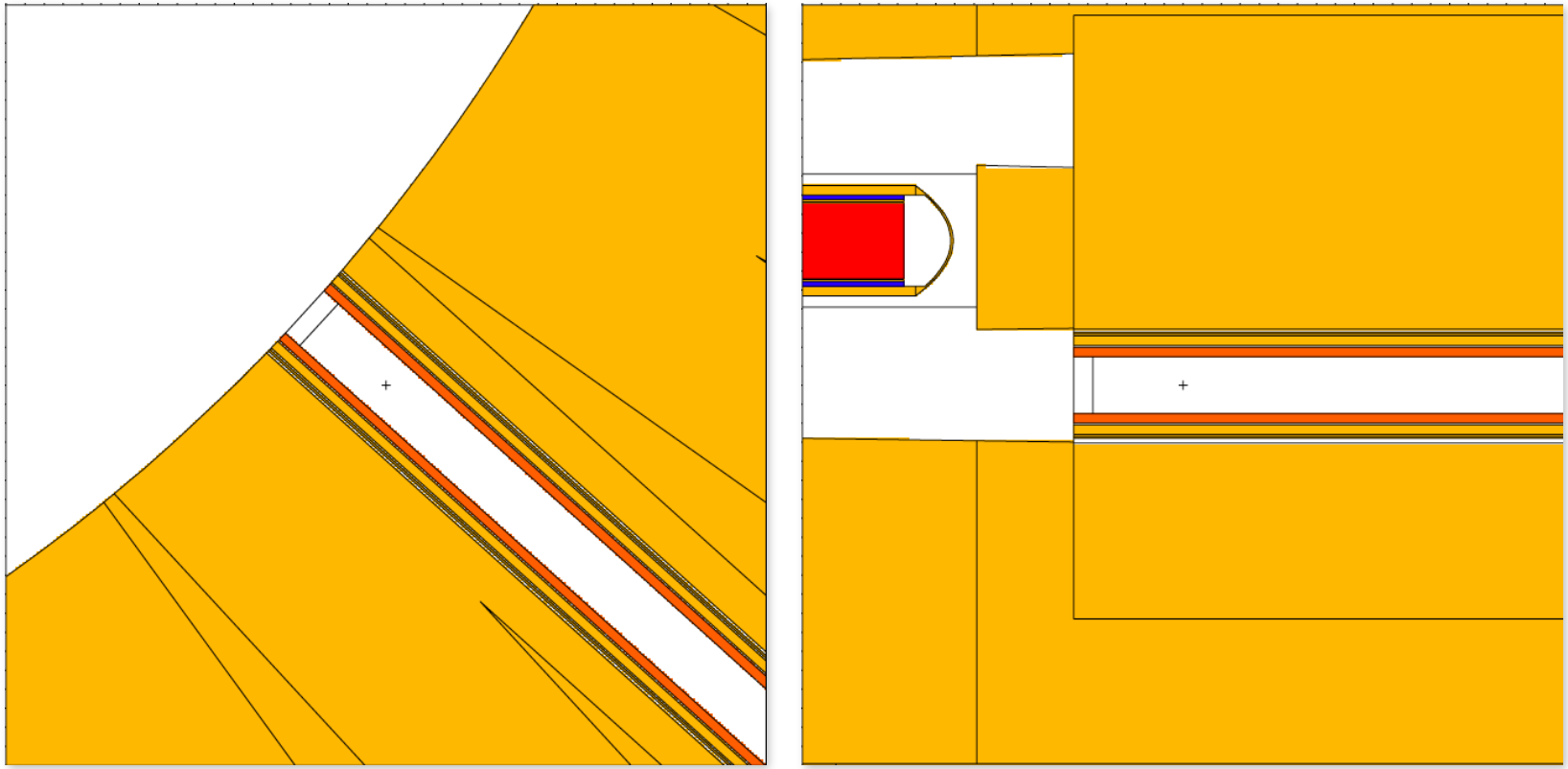

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Neutron Guide Insert

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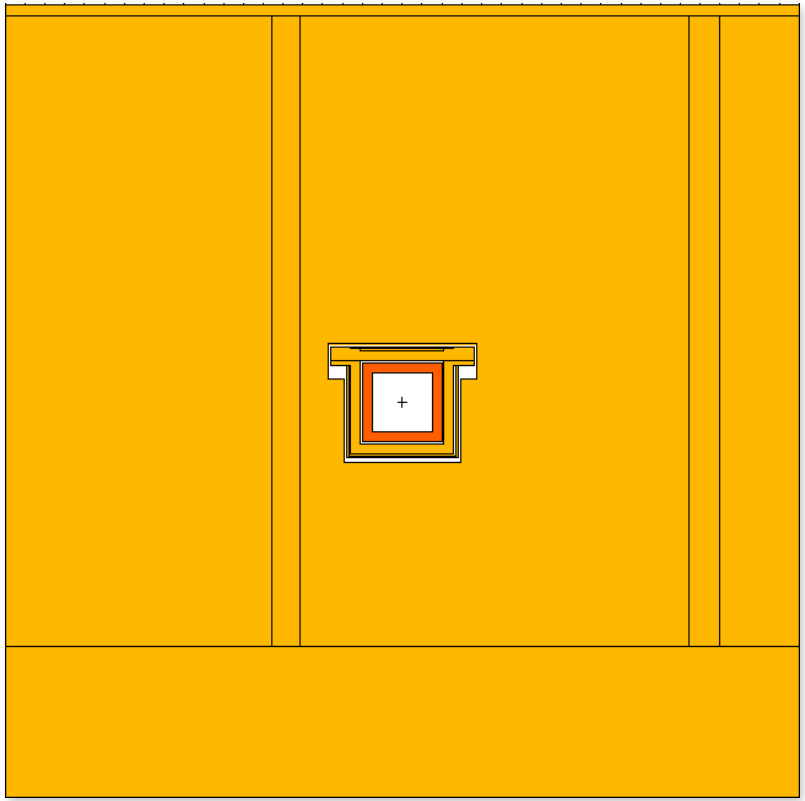
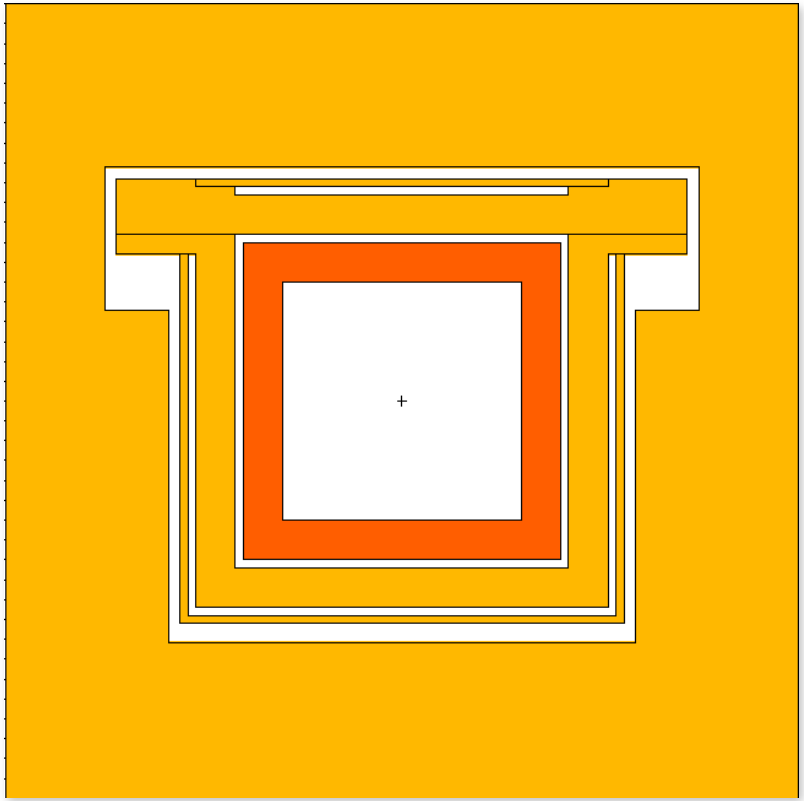
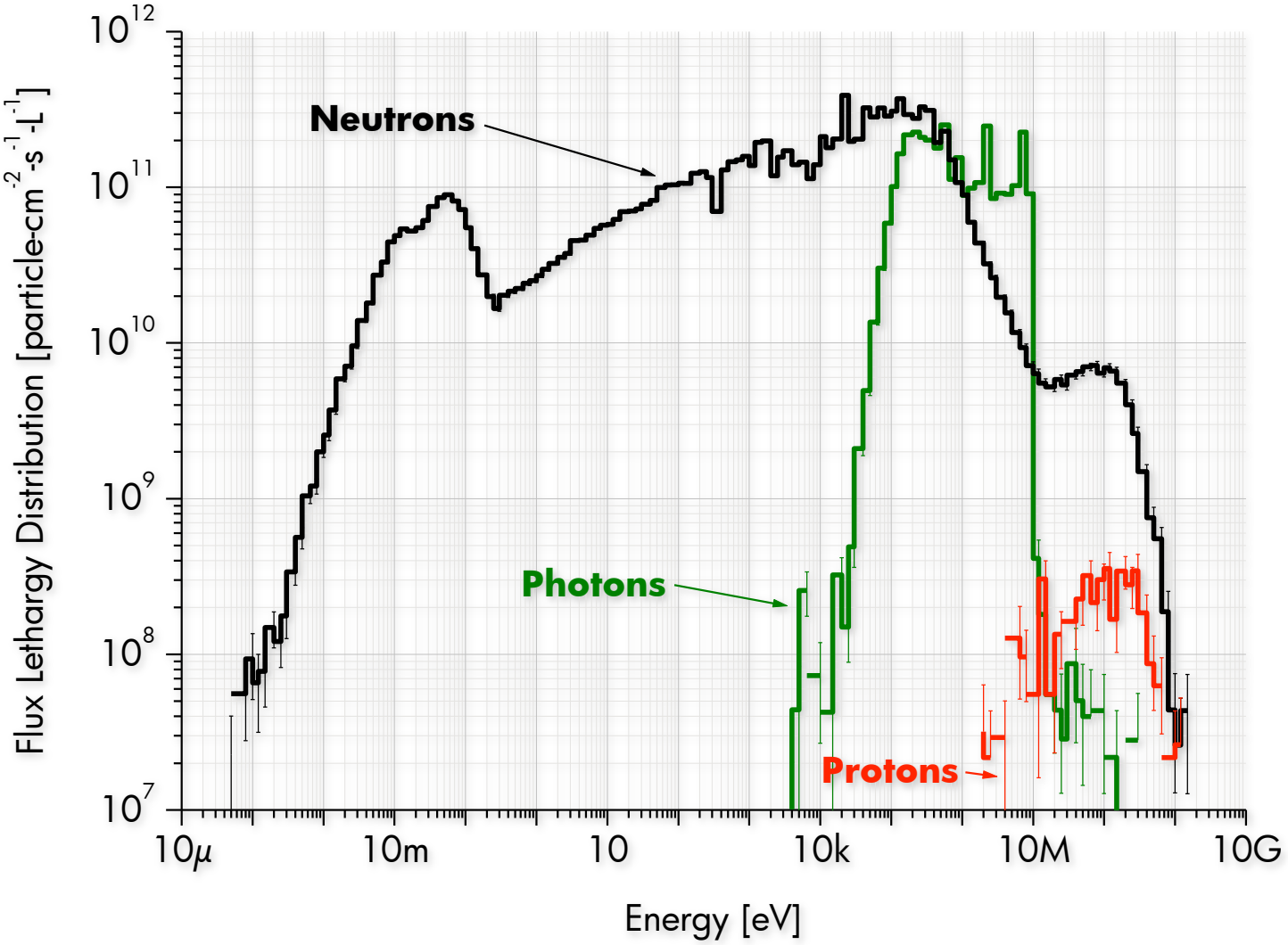




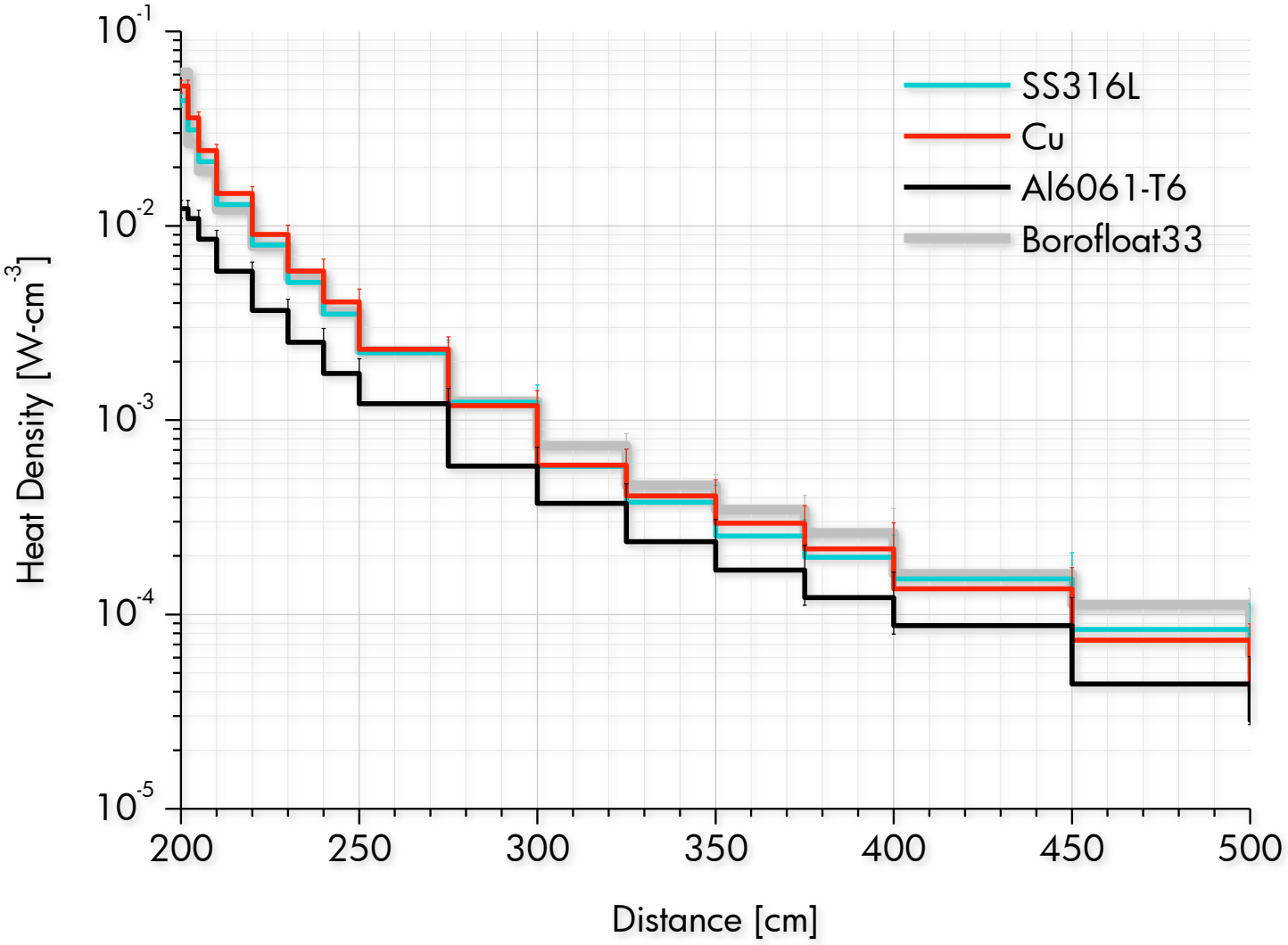
Particle Spectra

Time-average flux at the tip of neutron guide vs energy



SUBSTRATE HEAT LOAD

Heat density vs neutron guide length



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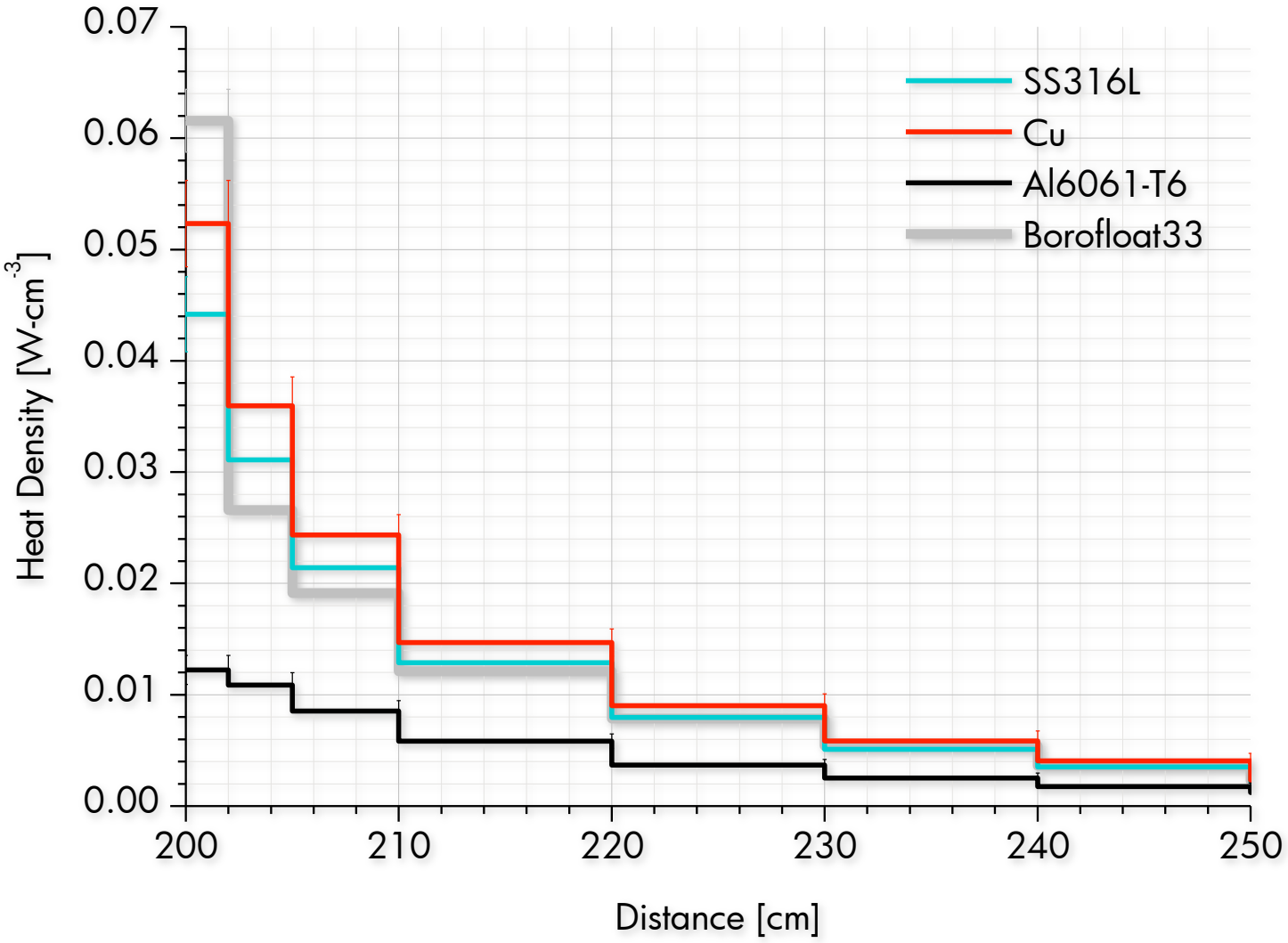
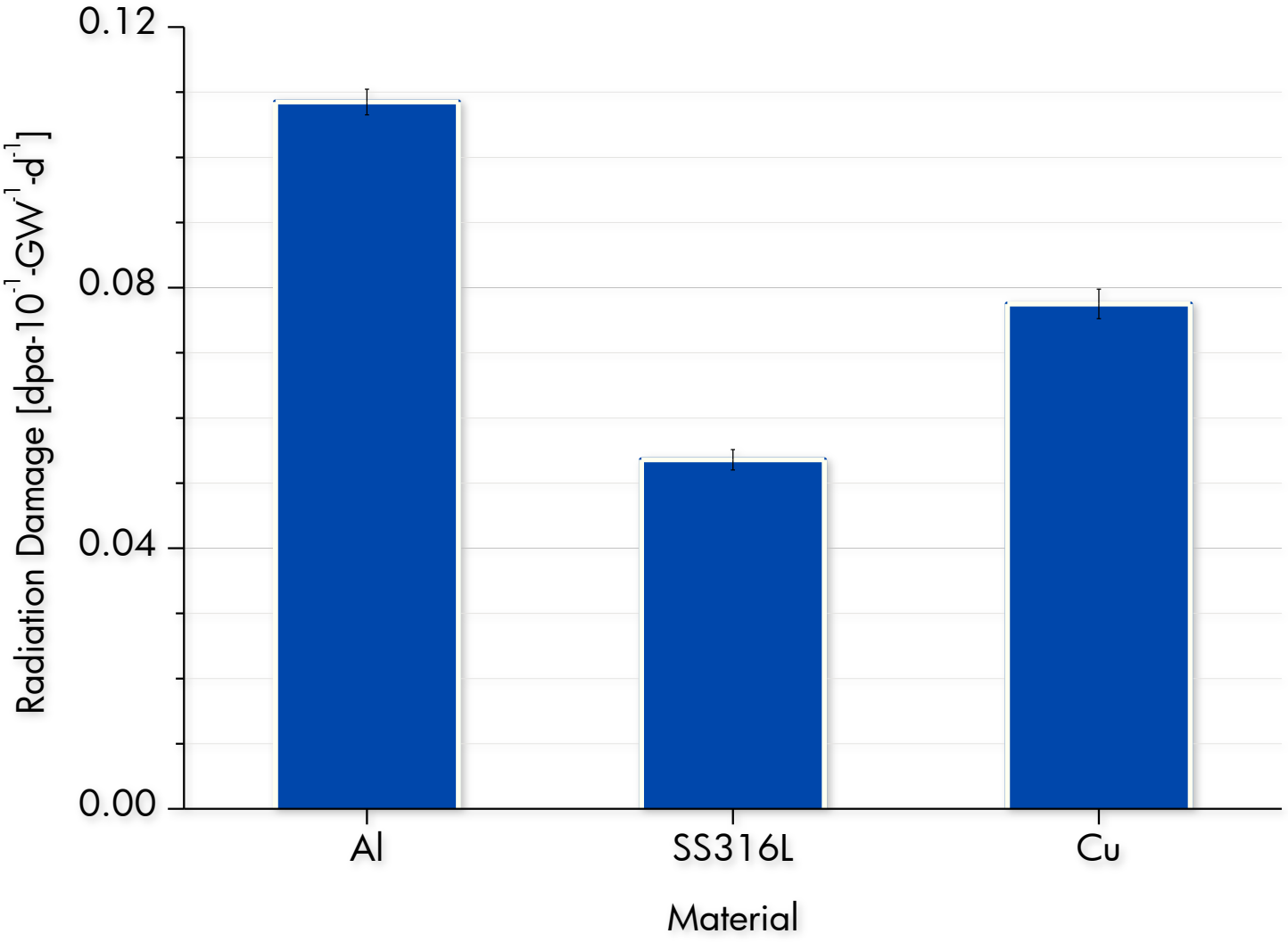


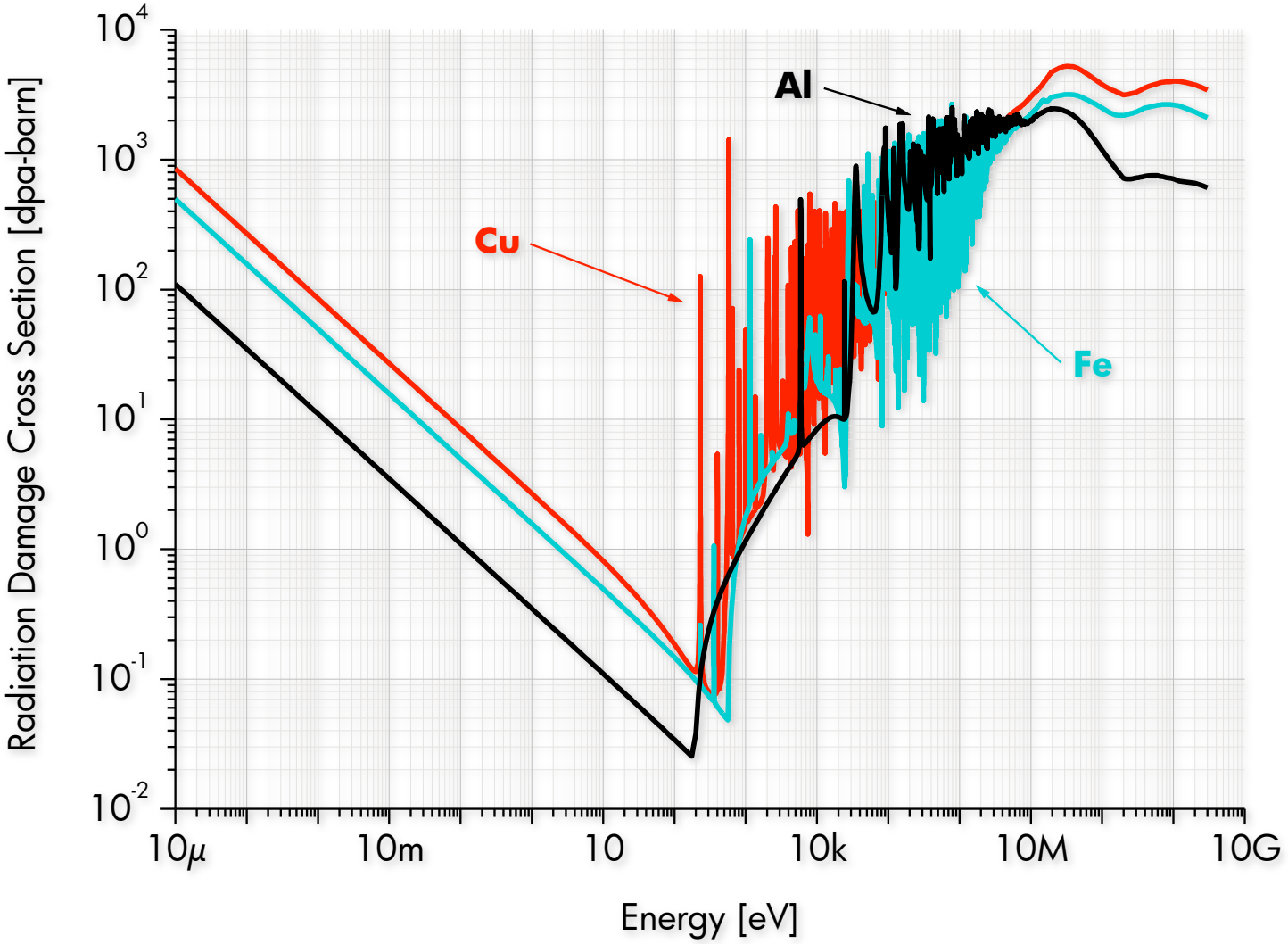
SUBSTRATE RADIATION DAMAGE

Peak dpa after about 10 years of operation



Neutron-Induced Damage

Radiation damage cross section



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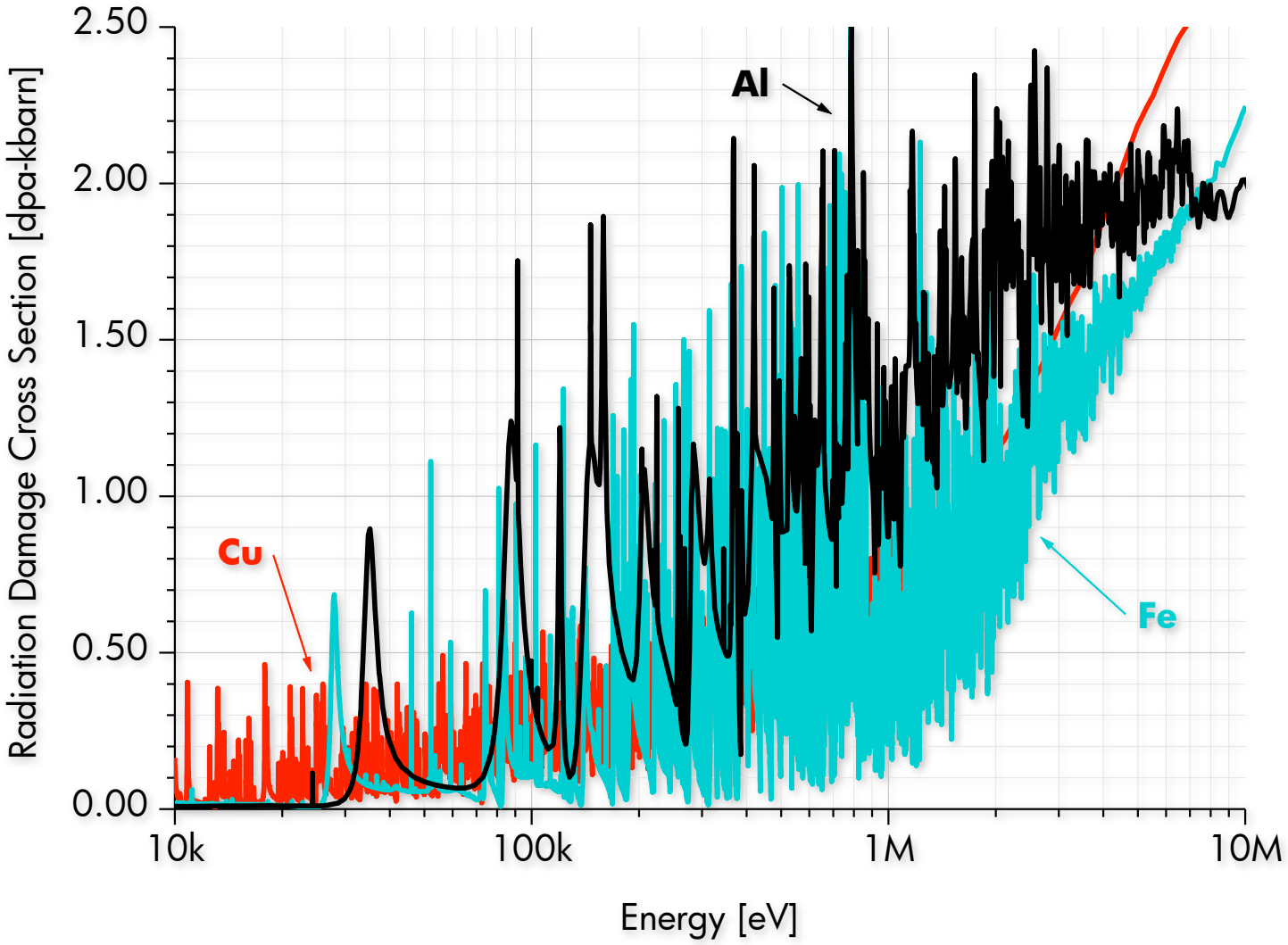

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Future Tasks

Newer versions of Target Station Monolith neutronic master model

Continuous updates

Newer versions of neutron guide inserts

Updates from beam optics and engineering groups are expected

Gas production and activation

Similar to what Zsófia Kókai has done with TDR model

Analysis of neutron guide inserts in different viewports

For both lower and upper decks